



LICHENICOLOUS FUNGI FROM THE WESTERN PYRENEES, FRANCE AND SPAIN. IV. ASCOMYCETES*

Javier ETAYO‡ and Paul DIEDERICH§

Abstract: Twenty species of lichenicolous ascomycetes are recorded for the western Pyrenees. *Capronia hypotrachynae* Etayo & Diederich (on *Hypotrachyna* species, also known from the Canary Islands and from Papua New Guinea), *Llimoniella pubescens* Etayo & Diederich (on *Lepraria* species, also from Scotland and Papua New Guinea), *Polycoccum microcarpum* Diederich & Etayo (on *Cladonia* species, also from Scotland), *Skyttea megalosporae* Etayo & Diederich (on *Megalospora tuberculosa*), *Sphaerellothecium cinerascens* Etayo & Diederich (on *Cladonia parasitica*) and *S. parmeliae* Diederich & Etayo (on *Parmelia* s. str., also from Finland) are described as new.

© 1998 The British Lichen Society

Introduction

Lichenological exploration of the western Pyrenees (France and Spain) during the past 10 years has resulted in the authors discovering a very diverse biota of lichenicolous fungi. This is our fourth contribution dealing with taxa new to science or species not previously recorded in the western Pyrenees.

Materials and Methods

Most specimens studied are located in the personal collections of the authors, type specimens in MA-Lichen and LG; specimens from E have not been examined by us, but by Dr B. Coppins. Ascomata were measured under a binocular microscope at a magnification of $\times 40$. Detailed microscopical examination of specimens was carried out at a magnification of $\times 1000$. Microscopical measurements have been made in water and drawings were made of specimens mounted in water, Congo red or lactophenol cotton blue (LCB).

The Species

Arthonia amylospora Almq.

This species was previously known only from the type specimen collected in Sweden on a sterile crustose lichen referred to *Porpidia glaucophaea* by Triebel (1989: 58–59).

Great Britain: V.C. 86, *Stirling*: Loch Lomond NNR, Inchcailloch, 26/405.901, on ?*Porpidia glaucophaea*, ix 1983, *Coppins* 10241 & *Woods* (E). V.C. 88, *Mid-Perths*: Killin, Meall na Samhna, 27/4.3, on ?*P. glaucophaea* vii 1978, *Coppins* 13449 (E). V.C. 104, *North Ebudes*: Skye, Staffin, Quirang, 18/4.6, on unidentified white crust [K–, C–, I–], vi 1979, *Coppins* 4171 (E).—

*Part III=Etayo & Diederich (1996).

‡Navarro Villoslada 16, 3° dcha, E-31003 Pamplona, Spain.

§Musée national d'histoire naturelle, rue Münster, L-2160 Luxembourg, Luxembourg.

Spain: *Navarra:* P^{to} de Larrau, 1585 m, calcareous schists, on an unidentified crust [medulla I+blue] (*Porpidia?*), vii 1993, *Etayo* 11889.

***Arthonia graphidicola* Coppins**

This species is known from England, Scotland and Ireland (Coppins 1992: 82), France (Coste 1993) and Luxembourg (Diederich *et al.* 1991: 9). Our specimen agrees well with the description given by Coppins (1989), except that the brown hyphae in the host thallus are I+blue.

Spain: *Navarra:* Leazcue, 580 m, on *Graphis scripta* (with *Stigmidium microspilum*), iii 1996, *Etayo* 13830.

***Arthonia thelotrematis* Coppins**

This species is confined to *Thelotrema lepadinum* growing on *Corylus*. It is already known from the British Isles and the Azores (Coppins 1992: 87), and is thus new for continental Europe.

France: *Pyrénées-Atlantiques:* S^{te}-Engrâce, Gorges de Kakouetta, on *Corylus*, on *Thelotrema lepadinum*, vii 1993, *Etayo* 12087.

***Arthrorhaphis aeruginosa* R. Sant. & Tønsb.**

Recently described by Santesson & Tønsberg (1994) from Norway, Scotland and North America. These are the first records from the Pyrenees, where the species grows at a high altitude in the subalpine belt, and from England.

France: *Pyrénées-Atlantiques:* Col de Suscousse, near the sky station, on road to Arette, *c.* 1200 m, vi 1992, *Etayo* 12091 & *Printzen* (hb. *Etayo*).—**Great Britain:** **V.C. 5, South Somerset:** Exmoor, Barle Valley, Hawkridge Wood, 21/88.29, v 1994, *Coppins* 16187 & *O'Dare* (E). **V.C. 104, North Ebudes:** Skye: S of Kyle of Lochalsh, S of Loch Na Béiste, v 1987, *Diederich* 8858; SSE of Broadford, Arnameacan, v 1987, *Diederich* 8305; W of Torrin, Allt na Dunaiche, v 1987, *Diederich* 8182. (All on *Cladonia squamules*.)

***Capronia hypotrachynae* Etayo & Diederich sp. nov.**

Capronia lichenicola a *C. epilobarina* ascomatibus latioribus et setis brevioribus, et a *C. normandinae* et *C. pseudonormandinae* ascosporis transverse 3–5-septatis, ascis brevioribus et ascomatibus latioribus differt.

Typus: Spain, *Navarra*, Valle del Baztán, Legate, peñas del Aracán, 871 m, on *Fagus*, on *Hypotrachyna revoluta*, vii 1993, *Etayo* 13861 & *Breuss* (MA-Lichen—holotypus; hb. *Diederich*, hb. *Etayo*—isotypi).

(Fig. 1)

Ascomata perithecioid, ostiolate, 130–200 µm diam., globose, black, dispersed, initially immersed, breaking through the cortex of the host thallus and partly covered by it later; setae dark brown, aseptate, simple, thick-walled, 5–35 × 3–4 µm, in many ascomata all under 10 µm long and almost invisible macroscopically; perithecial wall *c.* 15–20 µm thick, of *textura angularis*, dark brown in the outer part, hyaline in the inner part, with cells 5–8 × 2–4 µm.

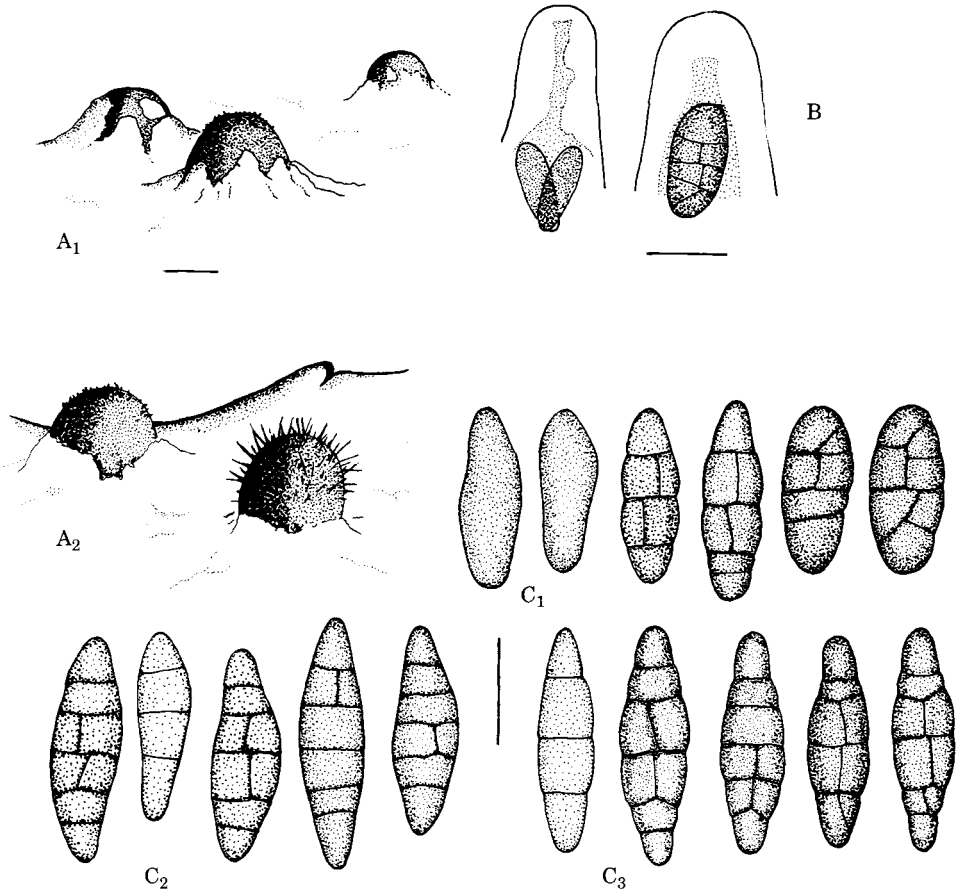


FIG. 1. *Capronia hypotrachynae*: A, Habitus (A1, holotype; A2, *Diederich* 10137b); B, Ascus apex in water (holotype); C, Ascospores (C1, in water, *Etayo* 13859; C2, in LCB, *Diederich* 10137b; C3, in water, holotype). Scales: A=100 μ m, B–C=10 μ m.

Hamathecium absent at maturity; centrum I–. *Asci* clavate, bitunicate, wall apically thickened, epiplasma I+ orange, 8-spored, 50–68 \times 10–16 μ m, with ascospores irregularly arranged in the ascus. *Ascospores* 0–3-septate when young, submuriform when mature, with 3–5 transverse and 0–1 longitudinal septa, constricted at the septa, not halonate, light grey to brownish, 12–19 \times 5.5–7.5 μ m.

Hosts: *Hypotrachyna costaricensis* (Nyl.) Hale, *H. endochlora* (Leight.) Hale and *H. revoluta* (Flörke) Hale (thallus).

Distribution: The new species is known from France, continental Spain, the Canary Islands (Gomera) and Papua New Guinea.

Notes: In the specimen from Papua New Guinea, most ascomata are densely covered by long setae that are up to 35 μm long. Some ascomata in the same collection appear to be glabrous under the stereomicroscope, and only short setae, reaching 10 μm in length, are visible using a microscope (magnification $\times 1000$). In the European specimens, no ascomatal setae could be seen macroscopically, which led us to believe initially that a different species was involved; microscopically, however, numerous short setae can also be observed in these European specimens, which are indistinguishable otherwise from the material from Papua New Guinea. The new species could be confused with several other lichenicolous species of *Capronia* with submuriform ascospores: *Capronia epilobarina* Kondratyuk & D. J. Galloway (see Etayo & Diederich 1996: 96), *C. normandinae* (see below) and *C. pseudonormandinae* Diederich (Aptroot *et al.* 1997: 47–48). The distinguishing features of these species are summarized in Table 1.

Additional specimens examined: **France:** Pyrénées-Atlantiques: Col de Burdincurutcheta, 800 m, in a *Fagus-Abies* wood, on *Hypotrachyna revoluta*, iv 1995, Etayo 13860.—**Spain:** Navarra: Urroz de Santesteban, pantano de Leurtza, 900 m, on *Fagus*, on *H. revoluta*, ii 1994, Etayo 13859. Canary Islands: Gomera, Vallehermoso, raso de la Bruma, 1000 m, on *H. endochlora*, viii 1994, Etayo 13177.—**Papua New Guinea:** Simbu prov.: Mount Wilhelm, Pindaunde valley, near the hut on the shore of lake Piunde, 3600 m, terricolous, on *H. costaricensis*, viii 1992, Diederich 10137 (b).

Capronia normandinae R. Sant. & D. Hawksw.

This species, confined to *Normandina pulchella*, is already known from Chile, Madeira and Scotland (Hawksworth 1990: 395–397) and from Papua New Guinea (Aptroot *et al.* 1997: 47), and is therefore new to continental Europe.

France: Pyrénées-Atlantiques: S of Tardets-Sorholus, Gorges de Kakouetta, on *N. pulchella*, vii 1991, Diederich 9560, 9581.—**Spain:** Navarra: Roncesvalles, Lindux, on *Fagus*, on *N. pulchella* (with *Sclerococcum normandinae*), ix 1991, Etayo 6017.

Dacampia rufescens (Vouaux) D. Hawksw.

Hawksworth (1986: 497–500) reported this species on *Peltigera rufescens* from northern France and Great Britain.

Spain: Navarra: W Pamplona, Sierra de Urbasa, P^o de Urbasa, on *Peltigera* sp., vii 1991, Diederich 9646; Baraibar, S of Miguel de Aralar, track to Casa forestal, on *P. rufescens*, vii 1993, Etayo 11959 & Breuss.

Guignardia olivieri (Vouaux) Sacc.

This species is known from many European countries, and from Israel, mostly on *Xanthoria parietina* (Clauzade *et al.* 1989: 47; Etayo 1996; Kondratyuk *et al.* 1996: 60–61; Navarro-Rosinés *et al.* 1994; Santesson 1993: 87).

Spain (all on *Xanthoria parietina*): Navarra: W of Pamplona, Sierra de Urbasa, P^o de Urbasa, vii 1991, Diederich 9631 & Etayo 5946; Cilveti, on *Acer*, xii 1994, Etayo 12251; alto de Erro, 800 m, iv 1995, Etayo 12877; Iragui, 700 m, *Quercus faginea* wood, iii 1996, Etayo 13808. Soria:

TABLE 1. The features distinguishing the known lichenicolous Capronia species with submuriform ascospores*

	Species		
	<i>C. hypotrachynae</i>	<i>C. epilobarina</i>	<i>C. normandinae</i>
Ascomatal diam.	130-200	50-70	100-150
Setal length	5-35	35-70	25-50(-90)
Asci	50-68 × 10-16	45-50 × 14-17	65-80 × 22-30
Ascospore septa	3-5 × 0-1	3-5 × 0-1	(3-)5(-6) × 0-1(-2)
Ascospore size	12-19 × 5.5-7.5	17-23 × 3.5-7	15-21 × 7.5-9
Host	<i>Hypotrachyna</i> species	<i>Lobriaria</i> species	<i>Normandina pulchella</i>
			Host of <i>Lauderiidsaya simodense</i>

*All measurements are given in µm.

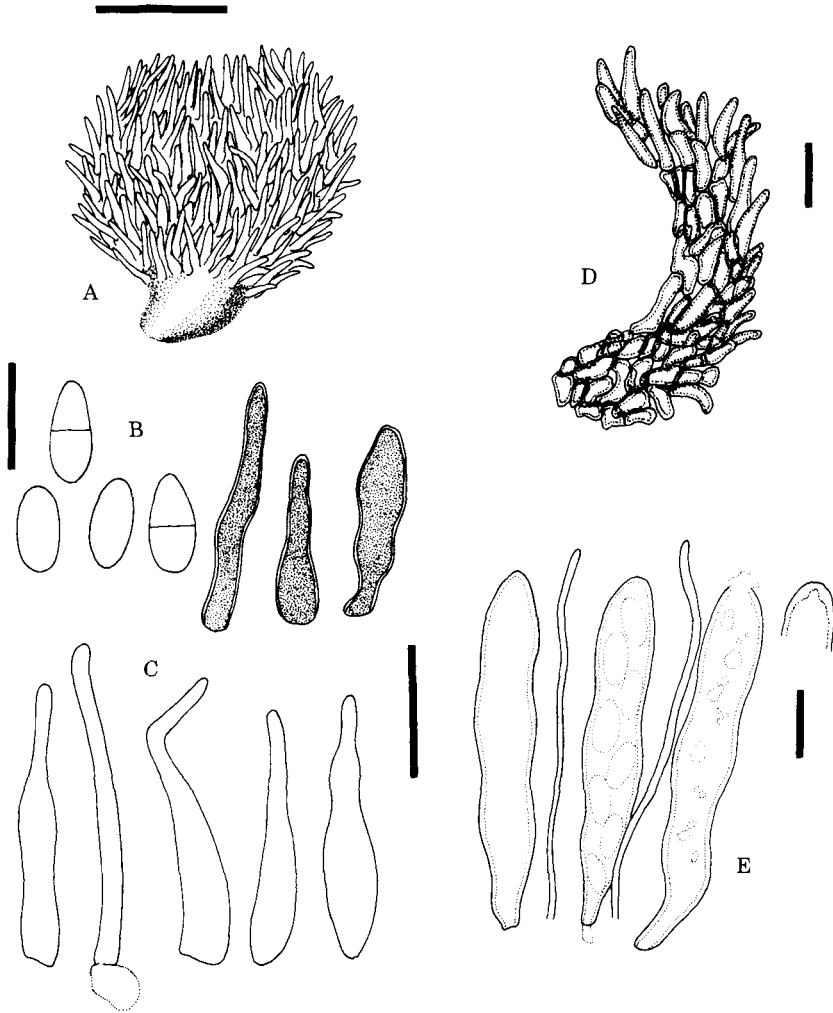


FIG. 2. *Llimoniella pubescens* (holotype): A, Habitus; B, Ascospores; C, Excipular hairs (schematically below); D, Exciple; E, Asci and paraphyses. Scales: A=100 μ m, B-E=10 μ m.

Calatañazor, road to La Fuentona, 1000 m, viii 1995, *Etayo* 12988. *La Rioja*: Tierra de Cameros, Gallinero de Cameros, 1000 m, iv 1996, *Etayo* s.n.

***Llimoniella pubescens* Etayo & Diederich sp. nov.**

Llimoniella lichenicola, a *L. neglecta* excipulo pubescenti et ascosporis brevioribus interdum 1-septatis differt.

Typus: Spain, Navarra, alto de Lizarraga, 900 m, on *Fagus*, on *Lepraria lobificans*, iv 1992, *Etayo* 3052 (MA-Lichen—holotypus; LG, hb. Diederich, hb. Etayo—isotypi).

(Fig. 2)

Ascomata apothecia, lichenicolous on the thallus of *Lepraria*, at first immersed, later erumpent, 0.09–0.25 mm diam., black, initially closed, opening by a pore, covered by black hairs, attached to the substratum by a narrow foot. *Ectal exciple* greenish grey, K+ blackish brown, 20–25 µm thick in the lower part, 10 µm thick laterally, prosoplectenchymatous, not carbonized; hairs greenish grey, wall thin and uniform, smooth, non-septate, 15–30 × 3–4 µm (2 µm thick near the apex). *Hymenium* olivaceous green, more strongly pigmented in the upper and in the lower parts, 40–45 µm tall. *Paraphyses* filiform, 1.5–2 µm thick. *Asci* cylindrical, 35–52 × 5.5–6.5 µm, wall uniformly thin, not reacting with iodine, 8-spored. *Ascospores* hyaline, ellipsoid, 0–1-septate, 5.5–9 × 2.5–3.2 µm.

Hosts: *Lepraria* species, including *L. lobificans* Nyl. The host of the type specimen has been studied by TLC and contains atranorin, zeorin, stictic and constictic acids. The other specimens were too small for TLC analysis.

Distribution: Known from the Spanish Pyrenees, Scotland and Papua New Guinea.

Notes: The new species is similar to *L. neglecta* (Vain.) Triebel & Rambold, from which it is distinguished by the presence of excipular hairs, and by shorter ascospores that become 1-septate [the ascospores measure 9–11(–14) × 2–3(–3.5) µm in *L. neglecta*]. It may be conspecific with a specimen with excipular hairs mentioned by Kümmerling *et al.* (1993) on *Lepraria* sp., and illustrated by those authors (loc. cit.: 155, fig. 2). *Llimoniella neglecta* seems to be confined to species of the *Lepraria neglecta*-group (Kümmerling *et al.* 1993). The new species is known from *L. lobificans* and possibly another unidentified species from New Guinea, both not belonging to the *L. neglecta*-group.

Additional specimens examined: **Great Britain**: V.C. 104, North Ebudes: Skye: SW Broadford, S of grave yard, on *Lepraria lobificans*, v 1987, Diederich 8176; Tokavaig wood, on *Lepraria* sp., v 1987, Diederich 8098.—**Spain**: Navarra: Lecumberri, S of Miguel de Aralar, Artzainzulo cave, 758 m, on calcareous rock in a cave, on *Lepraria* sp., xi 1991, Etayo 11296 & Calvo.—**Papua New Guinea**: Madang prov.: Finisterre range, Yupna valley, Teptep village, trail in NNW and deep valley in N direction, 2500 m, 5°57'S, 146°33'E, on *Lepraria* sp., vii 1992, Diederich 10730.

Muellerella hospitans Stizenb.

Our collections seem to represent the first Iberian records of this species growing in apothecia of *Bacidia fraxinea* and *B. rubella*.

Spain: Navarra: La Barranca, Urdiain, 525 m, on *Bacidia rubella*, ii 1988, Etayo 4041; Sierra de Urbasa, Cargadero, 920 m, on *B. fraxinea*, iii 1991, Etayo 5816; *ibid.*, Crezmendi, 1100 m, Etayo 469; Leazcue, 580 m, *Fagus* wood, on *B. rubella*, iii 1996, Etayo 13789.

Opegrapha anomea Nyl.

Opegrapha pertusariae

(Vouaux) Hafellner

(Fig. 3)

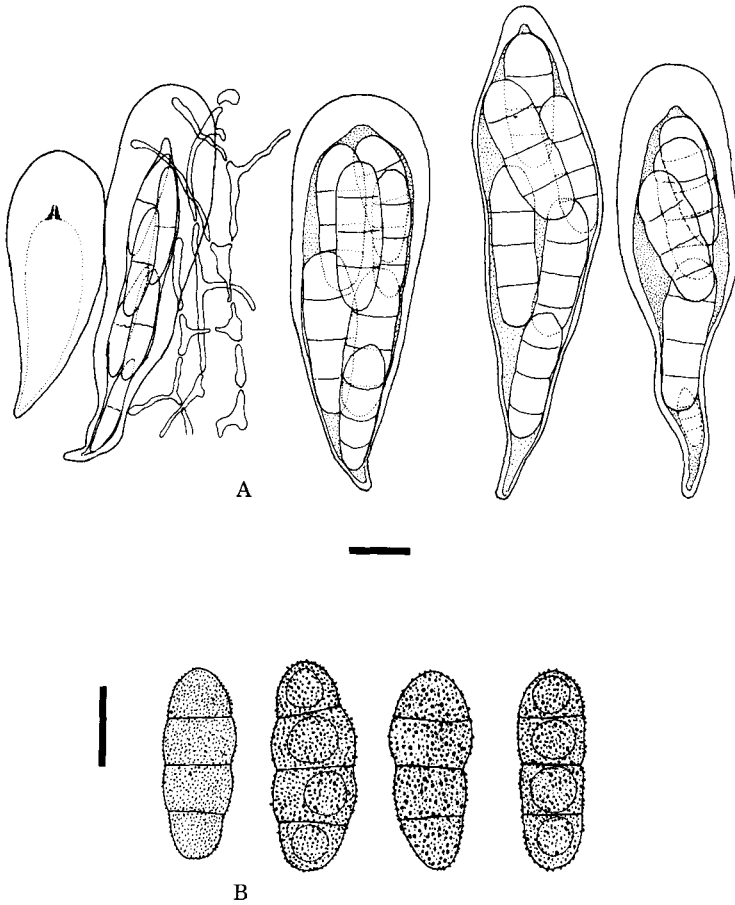


FIG. 3. *Opegrapha anomea* (Etayo 12678 & Printzen). A, Immature asci and paraphyses (left), mature asci with hyaline ascospores (right); B, Mature ascospores. Scales: A–B=10 μ m.

Two closely related *Opegrapha* species with elongate ascomata and 3-septate ascospores have been described on *Pertusaria*: *O. anomea* has hyaline ascospores, $23\text{--}26 \times 7\text{--}9 \mu\text{m}$, and is known from France on *P. amara*; *O. pertusariae*, with ascospores hyaline when young, brown at maturity and $20\text{--}26 \times 8\text{--}9 \mu\text{m}$, is known from the Canary Islands on *P. exalbescens* (Clauzade *et al.* 1989: 63; Hafellner 1994: 16). As the colour of the ascospores may depend only on the degree of maturity, we propose to consider both taxa provisionally as synonymous. The ascospores in our specimens are 3-septate, hyaline when young, brown at maturity and $22\text{--}26 \times 7\text{--}8.5 \mu\text{m}$.

France: *Pyrénées-Atlantiques*: Col de Suscousse near ski station, on *Fagus*, on *Pertusaria albescens*, vi 1992, Etayo 12678 & Printzen (hb. Etayo); SW of Larrau, near the road to Spain, in a *Fagus* wood, on *P. amara*, vii 1990, Diederich 9179.

Plectocarpon sampaiana Diederich & Etayo

This cryptic species, restricted to *Fuscopannaria sampaiana*, was previously known from two collections in Spain and Scotland (Diederich & Etayo 1994). It is new for France.

France: *Pyrénées-Atlantiques*: Bois d'Astaquieta, road to Occabe and Esterencuby, 1200 m, iv 1995, *Etayo* 12895.—**Great Britain:** **V.C. 97, Westerness:** N side of Loch Sunart, 1 km SE of Salen, An Cnap, c. 17/695.641, iii 1983, *Coppins* 9323 & *Jørgensen* (E); 3 km E of Glenfinnan, Drochaid Sgairinnir, 17/931.799, vi 1978, *Coppins* 3533 (E). **V.C. 98, Argyll Main:** Loch Creran, Glasdrum, 27/00.45, v 1976, *Coppins* 1829 & *Tibell* (E); Inverary, Glen Shira, SW of Kilbllaan, 27/126.130, i 1996, *B. J. & A. M. Coppins* 16764 (E); E of Inverary, Achnatra Woods, E of Achnatra, 27/13.09, i 1996, *B. J. & A. M. Coppins* 16773 (E).—**Spain:** *Navarra*: Lanz, 750 m, on *Fagus*, x 1994, *Etayo* 12591. (All specimens on *Fuscopannaria sampaiana*.)

Polycoccum microcarpum Diederich & Etayo sp. nov

Ascomata lichenicola, perparva, 30–60 µm diam., subglobosa, ostiolata, atra, aggregata; paries brunnea, 6–9 µm crassa, cellulis 2–4 µm. Pseudoparaphyses anastomosantes, 1.5–2 µm latae, centrum I–. Asci elongato-clavati, bitunicati, 30–35 × 15 µm, 8-spori. Ascospores 1-septatae, ovaes, laeves, fuscae, 12–14.5 × 4.5–7 µm.

Typus: France, *Pyrénées-Atlantiques*, route de Arette vers Arette-la-Pierre-S^t-Martin, sous le Pic Soulaing au Bois de Guillers, 1300 m, futaie de hêtres et de sapins, on *Cladonia*, vii 1989, *Sérusiaux* 10580 (a), *James & Rose* (LG—holotypus; hb. Diederich—isotypus).

(Fig. 4)

Ascomata perithecioid, immersed in convex galls on the squamules of the host, arising by groups of 20–80, black, ostiolate, 30–60(–100) µm diam.; wall brown, 6–9 µm thick, composed of polyhedral or elongate cells, 2–4 µm thick, at maturity dark brown and much thicker around the ostiole. *Hamathecium* composed of anastomosing pseudoparaphyses, 1.5–2 µm thick, I– (in Lugol's). *Asci* elongate-clavate, bitunicate, 30–35 × 15 µm, 8-spored, I–. *Ascospores* brown, 1-septate, slightly constricted at the septum, cells often unequal in size, without a distinct ornamentation, 12–14.5 × 4.5–7 µm.

Hosts: *Cladonia* species, incl. *C. bellidiflora* (Ach.) Schaer., *C. cervicornis* (Ach.) Flot. subsp. *cervicornis* (squamules) and *C. digitata* (L.) Hoffm.

Distribution: France (*Pyrénées-Atlantiques*) and Great Britain (Isle of Skye).

Notes: Macroscopically, this species is easily recognized by the formation of gall-like swellings on the squamules of *Cladonia*, containing numerous extremely small ascomata. In the centre of the galls, the perithecia are often growing very close to each other and are sometimes connected by a blackish tissue. The new species is distinguished from all other species of the genus by the much smaller ascomata. *Polycoccum cladoniae* Diederich & D. Hawksw., which is also known from *Cladonia*, has larger ascomata (100–250 µm diam.), which are dispersed over the host thallus and superficial at maturity, longer asci and larger ascospores (Hawksworth & Diederich 1988).

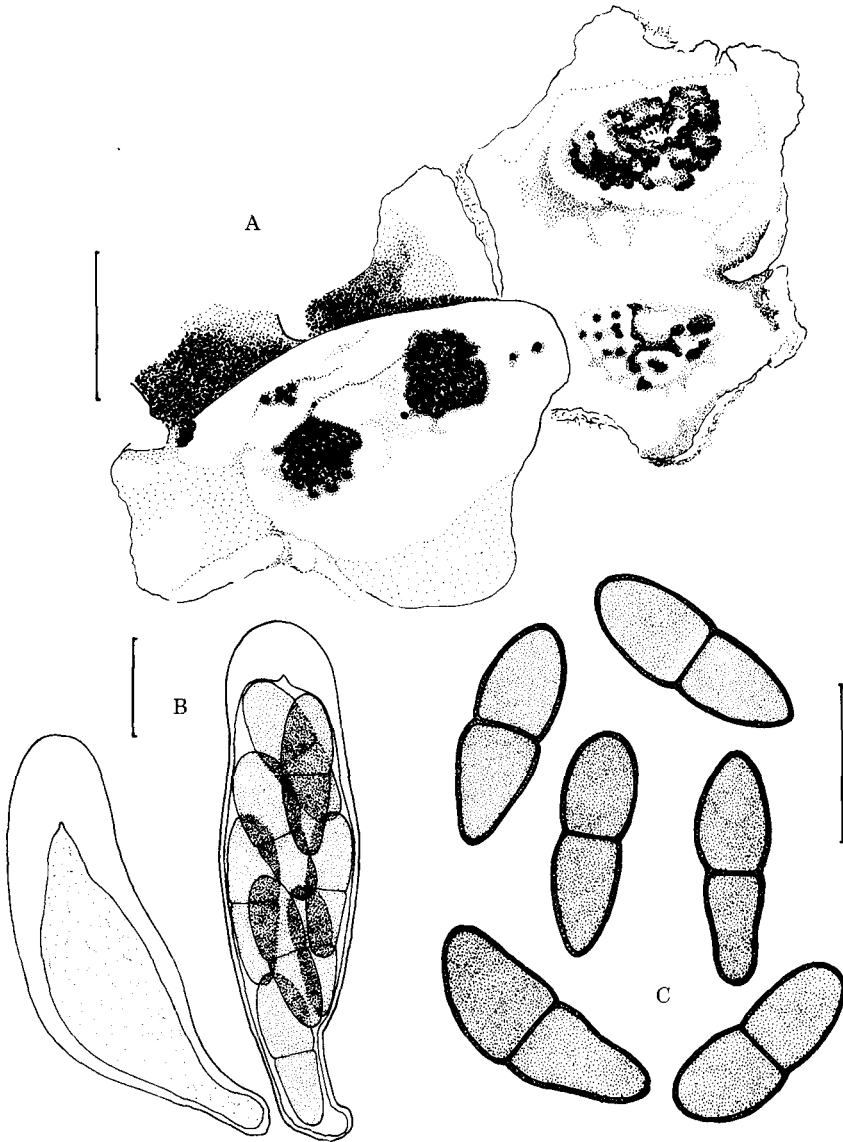


FIG. 4. *Polycoccum microcarpum* (holotype): A, Galls on *Cladonia* sp.; B, Ascii; C, Ascospores. Scales: A=1 mm, B-C=10 μ m.

Additional specimens examined: **France:** *Pyrénées-Atlantiques:* S^{te}-Engrâce, Ravin de Soudet, bois d'Arbouty, i 1993, on *C. bellidiflora*, *Étayo* 3451 (hb. Etayo, hb. Diederich); 4 km from station d'Issarbe, 1375 m, on *Cladonia digitata*, iv 1995, *Étayo* 12910.—**Great Britain:** **V.C. 104, North Ebudes:** Skye, SW Broadford, S of grave yard, on *C. cervicornis* s. str., v 1987, *Diederich* 8158.

Reconditella physconiarum Hafellner & Matzer

This is the first Spanish record of this recently described species, previously known from Austria, Croatia, Portugal and Sweden (Matzer & Hafellner 1990).

Spain: Navarra: Iragui, 700 m, on *Quercus faginea*, on *Physconia distorta*, iii 1996, *Etayo* 13788, 13851.

Roselliniopsis tartaricola (Nyl.) Matzer

A common lichenicolous ascomycete, confined to *Pertusaria hemisphaerica* and *Ochrolechia tartarea* (Matzer 1993). Our specimen had been reported by Diederich & Roux (1991: 22) as *R. tropica* Matzer & R. Sant. The differences between both species are explained in Matzer (1993).

France Pyrénées-Atlantiques: S of Tardets-Sorholus, between S^{1c}-Engrâce and Pierre-S¹-Martin, in a forest with *Fagus* and *Abies*, on *Pertusaria hemisphaerica*, vii 1990, *Diederich* 9371.

Skyttea megalosporae Etayo & Diederich sp. nov.

Ascomata lichenicola, in thallis *Megalosporae* crescentia, immersa, primo clausa, poro aperientia; excipulum viride, pilis viridulis, 8–11 × 2.5–3 µm; hypothecium hyalinum; epihymenium viridulum; paraphyses filiformes, simplices. Asci 45–55 × 5–6 µm, apice incrassati, I–, 8-spore. Ascospores hyalinae, falcatae ad sigmoideae, extremitatibus acutis, 0(–1)-septatis, 22–46 × 2.5–3 µm.

Typus: France, Pyrénées-Atlantiques, au sud de Tardets-Sorholus, S^{1c}-Engrâce, vers Pierre-S¹-Martin, à 3 km après la dernière maison, col de Suscousse, *Fagus-Abies* wood, on *Megalospora tuberculosa*, vii 1991, *Etayo* 5904 & *Diederich* (MA-Lichen—holotypus; hb. Diederich, hb. Etayo—isotypi); *ibid.*, vii 1990, *Diederich* 9360 (hb. Diederich—topotypus).

(Fig. 5)

Ascomata immersed or rarely erumpent, margin often covered by the host thallus, black, 70–120 µm diam., initially closed, opening by a pore. *Lateral exciple* green, *c.* 40 µm thick; *basal exciple* greenish brown, *c.* 15 µm thick, prosoplectenchymatous; excipular hairs greenish, slightly curved, 8–11 × 2.5–3 µm; hypothecium hyaline, *c.* 10 µm thick; epihymenium greenish; hymenium of filiform, simple paraphyses, KI–; all greenish parts are K–. *Asci* cylindrical to clavate, 45–55 × 5–6 µm, wall apically thicker, 8-spored. *Ascospores* hyaline, falcate to sigmoid, with acute ends, 0(–1) septate, 22–46 × 2.5–3 µm.

Host: *Megalospora tuberculosa* (Fée) Sipman (thallus), sometimes accompanied by *Dactylospora microspora* Etayo, *D. cf. urceolata* (Th. Fr.) Arnold or *Sclerococcum hawksworthii* Etayo & Diederich.

Distribution: Common in the western French and Spanish Pyrenees.

Notes: The new species is similar to *S. fuispora* Sherw., D. Hawksw. & Coppins, but the ascospores are longer (20–28 × 2.5–3.5 µm in *S. fuispora*), more curved, sigmoid, and with acute apices (see Sherwood-Pike *et al.* 1980:

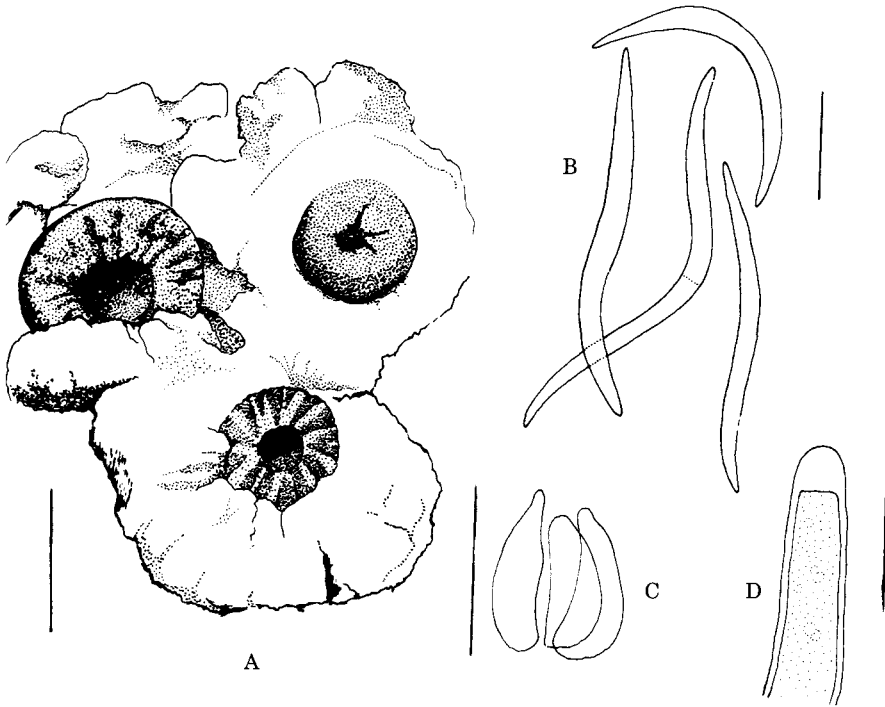


FIG. 5. *Skyttea megalosporae* (Etayo 12955): A, Habitus, on the thallus of *Megalospora tuberculosa*; B, Ascospores; C, Excipular hairs; D, Ascus apex. Scales: A=100 μ m. B–D=10 μ m.

484–486). According to the original description of *S. fusispora*, the apothecia in our new species are also smaller, and the exciple and excipular hairs more greenish.

The curved, sigmoid ascospores are also reminiscent of *Spirographa*, another genus of the *Odontotremataceae*. The recently described *Spirographa vinosa* Holien & Triebel has ascospores that are similar to those of *Skyttea megalosporae*, except that they are up to 5-septate (Holien & Triebel 1996). As *Spirographa vinosa* differs from *Skyttea megalospora* in having superficial apothecia lacking excipular hairs, we believe that both species are not congeneric, and that the new species is better placed in the genus *Skyttea*.

Additional specimens examined (all on *Megalospora tuberculosa*): **France:** Pyrénées-Atlantiques: Forêt d'Iraty, chalet Pedro, 1000 m, on *Fagus*, vii 1991, Etayo 5918 & Diederich; *ibid.*, iv 1995, Etayo 12901; forêt de Sare, near Bera de Bidasoa, col de Lizuniaga, 150 m, iii 1994, Etayo 12955; *ibid.*, iii 1995, Etayo 12740 & Marbach; bois d'Astaquieta, road to Occabe and Esterencuby, 1200 m, *Fagus* wood, iv 1995, Etayo 12904; S^{te}-Engrâce, ravin de Termy, on *Fagus*, vii 1993, Etayo 12956.—**Spain:** Navarra: Mendilaz, Mendilaz, 1200 m, *Fagus* wood, vii 1989, Etayo 5949; Ornoz-Mugaire, señorío de Bértiz, c. 400 m, *Fagus* wood, i 1994, Etayo 12087.

Sphaerellothecium cinerascens Etayo & Diederich sp. nov.

Ascomata lichenicola, perparva, 40–70 μ m diam., subglobosa, ostiolata, atra, semi-immersa vel superficialia. Hyphae 10–15 \times 2–3 μ m, fuscae, debiliter evolutae. Hamathecium nullum. Asci

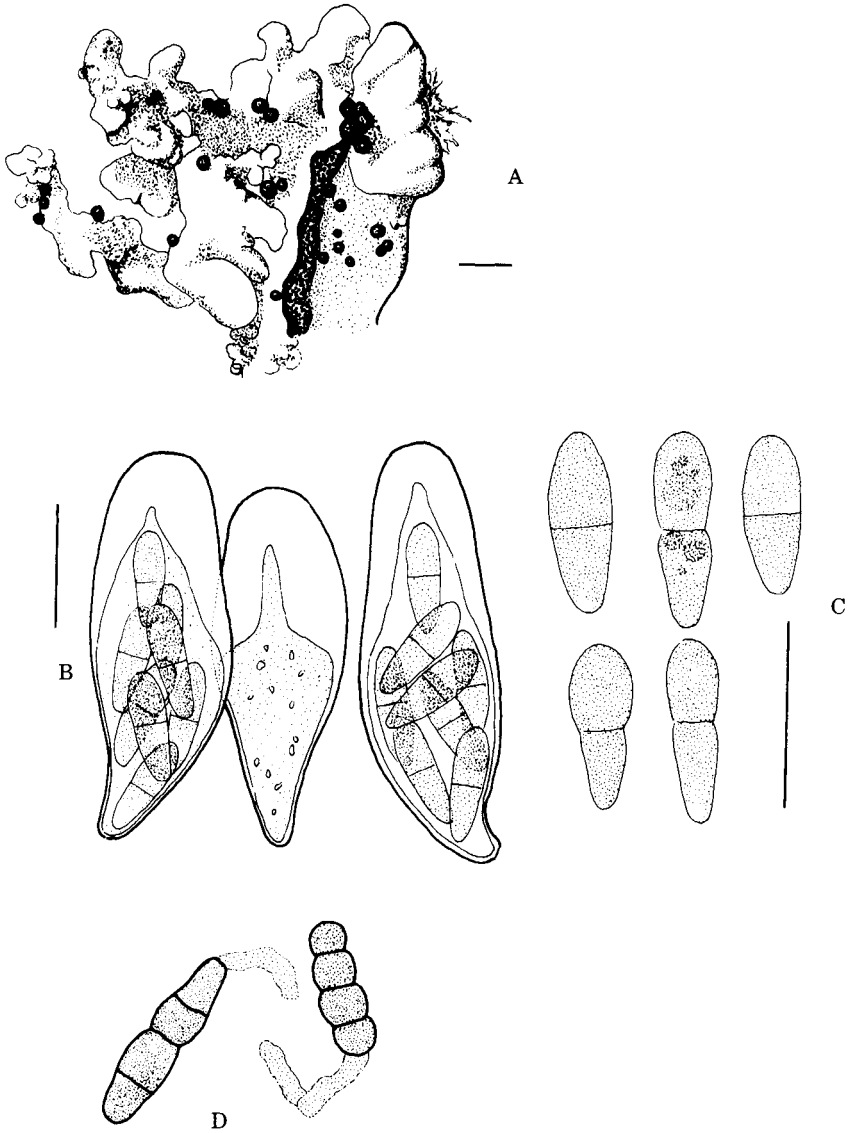


FIG. 6. *Sphaerellothecium cinerascens* (holotype): A, Habitus, on squamules of *Cladonia parasitica*; B, Asci; C, Ascospores; D, Germinating ascospores. Scales: A=200 μm , B–D=10 μm .

clavati, crassitunicati, 8-spore, 31–40 \times 8.5–11 μm . Ascospores 1-septatae, ovales, fuscae, 9–11.5 \times 3–4 μm .

Typus: Spain, Navarra, Oronoz-Mugaire, señorío de Bértiz, on the base of an old trunk of *Castanea sativa*, on *Cladonia parasitica*, xii 1985, *Etayo* 953 (MA-Lichen—holotypus; hb. *Etayo*—isotypus).

(Fig. 6)

Ascomata perithecioid, 40–70 µm diam., subglobose, ostiolate, black, dark brown when wet, first semi-immersed, later superficial, scattered or in groups. *Vegetative hyphae* 2–3 µm thick, brown (orange brown in KOH), branched-anastomosed, not or slightly constricted at the septa, not forming a superficial net on the host thallus, irregularly immersed, visible at a high magnification. *Ascomatal wall* brown, paraplectenchymatous, formed by isodiametric cells, 4–8 µm diam.; ostiole not prominent. *Hamathecium* without any visible paraphysoids or periphysoids at maturity, I–; periphyses developed in the upper part of the ascoma, simple, small, less than 10 × 1.5 µm. *Asci* clavate, 31–40 × 8.5–11 µm, wall apically thickened, young asci with a large ocular chamber, ascoplasma I+ yellow to orange, 8-spored, with ascospores irregularly arranged. *Ascospores* 1-septate, rarely 3-septate when mature, oval to ellipsoid, slightly constricted at the septum, not halonate, brown (grey-brown in KOH), 9–11.5 × 3–4 µm.

Host: Cladonia parasitica (Hoffm.) Hoffm. The thallus of the host changes to a characteristic grey tinge when colonized by *S. cinerascens*.

Distribution: Known from oceanic woods of the western Pyrenees in Spain and France.

Notes: We include this species provisionally in the genus *Sphaerellothecium* because of the I– reaction of the hamathecium and the asci, the brown ascospores and hyphae, and the absence of setae on the ascomatal wall. Hamathecial filaments have not been found with certainty and should be looked for carefully on richer material.

Two similar fungi have been described on species of *Cladonia*: *Echinothecium cladoniae* Keissl., a name of uncertain application and not validly published, refers to a lichenicolous fungus with setose perithecia (Santesson 1993: 79). *Sphaerellothecium cladoniicola* E. S. Hansen & Alstrup differs by a distinct superficial net of vegetative hyphae, hyaline ascospores and shorter asci (Hansen & Alstrup 1995: 35–37).

Most other species of *Sphaerellothecium* described by Hafellner (1993: 760–762), Triebel (1989) and Triebel *et al.* (1991) differ either in the presence of a distinct superficial net of dark hyphae or by hyaline ascospores, which become brownish only when post-mature. *Sphaerellothecium coniodes* (Nyl.) Cl. Roux & Diederich and *S. propinquellum* (Nyl.) Cl. Roux & Triebel both have larger ascospores (Roux & Triebel 1994: 527–533). In *S. atryneae* (Arnold) Cl. Roux & Triebel, the ascospores remain hyaline or pale for a long time and are slightly larger, the asci are broader, and the vegetative hyphae are thicker (Roux & Triebel 1994: 525–527).

The epithet *cinerascens* refers to the green thallus of the host turning greyish in the presence of the parasite.

Additional specimens examined (both on *Cladonia parasitica*): **France:** Pyrénées-Atlantiques: Ibarre, near S^t-Jean-Pied-De-Port, vi 1992, *Etayo* 3452 & *Printzen* (hb. Etayo, hb. Diederich).—**Spain:** Navarra: Ituren, monte Mendaur, xii 1986, *Etayo* 2040.

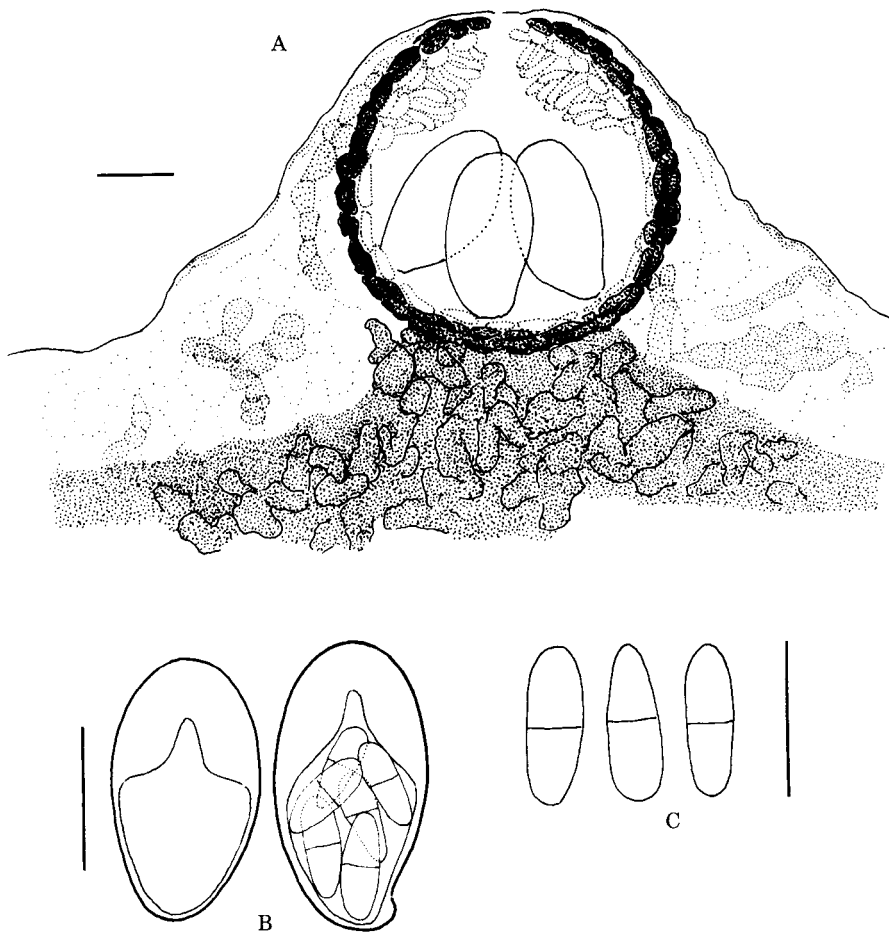


FIG. 7. *Sphaerellothecium parmeliae* (holotype): A, Section through an ascoma, showing dark layer in the host thallus; B, Asci; C, Ascospores. Scales: A–C=10 μ m.

***Sphaerellothecium parmeliae* Diederich & Etayo sp. nov.**

Ascomata lichenicola, perparva, 25–40 μ m diam., sphaerica, ostiolata, atra, semi-immersa vel superficialia. Hyphae 4–5 μ m crassae, fuscae, superficiales, ramosae et anastomosantes. Hamathecium abest. Asci ellipsoidei, crassitunicati, 8-spори, 19–23 \times 9–12.5 μ m. Ascosporae 1-septatae, ovales, hyalinae, maturitate fuscae, 8.5–10 \times 3–4 μ m.

Typus: France, Pyrénées-Atlantiques, S of S^t-Jean-Pied-de-Port, forêt d'Iraty, 0.5 km S of Chalet Pedro, 1000 m, on *Fagus*, on *Parmelia saxatilis*, vii 1991, Diederich 9690 & Etayo (LG—holotypus; E, IMI, M, UPS, hb. Diederich—isotypi); *ibid.*, on *P. sulcata*, Diederich 9689 & Etayo (GZU, hb. Diederich—topotypi); *ibid.*, vii 1990, on *P. saxatilis* and *P. sulcata*, Diederich 9233, 9239 (hb. Diederich—topotypi).

(Fig. 7)

Ascomata perithecioid, ostiolate, 25–40(–60) μ m diam., globose, black, semi-immersed to superficial, arising from large black necrotic areas of the

host thallus, black thallus areas and ascomata covered by a hyaline epicortex. *Vegetative hyphae* brown, smooth-walled, 4–5 µm diam., branched, often forming a superficial net on the host thallus. *Ascomatal wall* composed of dark brown *textura angularis* with cells 4–7 × 2–5 µm. *Hamathecium* without any visible paraphysoids or periphysoids at maturity, I–; periphyses developed in the upper part of the ascoma, simple, small, less than 10 × 1.5 µm. *Asci* ellipsoid, 19–23 × 9–12.5 µm, bitunicate, wall apically thickened, with a distinct ocular chamber, ascoplasma I_{Lugol} + orange or reddish, 8-spored, with ascospores irregularly arranged in the ascus. *Ascospores* 1-septate, oval, slightly constricted at the septum, not halonate, hyaline, rarely becoming brownish at maturity, 8.5–10 × 3–4 µm.

Hosts: *Parmelia saxatilis* (L.) Ach. and *P. sulcata* Taylor. The perithecia are situated in large black areas of the thallus and probably kill the host.

Distribution: The species is very frequent in the western Pyrenees (France and Spain), and is also known from Finland. In addition, we have seen specimens of *Parmelia saxatilis* and *P. sulcata* from Germany and Luxembourg with similar black areas, but without any perithecia. As the host lichens are very common and widespread in Europe, the parasite is likely to occur, and even to be frequent, throughout the continent.

Notes: This species fits the concept of the genus *Sphaerellothecium* well, as circumscribed by Roux & Triebel (1994); the fungus has small ascomata, the characteristic iodine reactions, and the superficial net of dark brown vegetative hyphae. No paraphysoids have been observed by us, which is surely due to the extremely small ascomata, in which almost no space is left between the mature asci.

In most ascomata only hyaline ascospores are present, and one has to search carefully to find a brownish ascospore. This situation is similar to that of the type species of the genus, *S. araneosum* (Rehm ex Arnold) Zopf, in which the ascospores remain hyaline for a long time and become brown only at maturity. The superficial net of vegetative hyphae is visible and well-developed in about 50% of the specimens, but can only be detected against the black background at a high magnification (× 80) with strong illumination. The characteristically black areas of the host thallus make it easy to detect this fungus in the field.

Sphaerellothecium araneosum is easily distinguished from the new species by large, 1–3-septate ascospores (13.5–17 × 5–7 µm), its occurrence on healthy, and not blackish, areas of the lichen thallus and by the different hosts (*Ochrolechia*, *Pertusaria* and *Varicellaria* species) (Roux & Triebel 1994: 519–523). The recently described *S. minutum* Hafellner, which also has hyaline ascospores, has larger ascomata, 60–80 µm diam., slightly larger ascospores, 9–13 × 3–5 µm, and grows on different hosts (*Sphaerophorus* species) (Hafellner 1993: 760–762). *Echinothecium reticulatum* Zopf, a fungus with a similar net of vegetative hyphae on *Parmelia* s. str., is distinguished by setose ascomata, which grow on more healthy, not blackish, parts of the thallus. The ascospores of other species of *Sphaerellothecium* described by Roux & Triebel (1994), Triebel (1989) and Triebel *et al.* (1991) all have larger

or brown ascospores. *Sphaerellothecium cladoniicola* E. S. Hansen & Alstrup has a very distinct net of dark superficial hyphae, slightly larger ascomata (30–60 µm diam.) and larger ascospores (8–12 × 5 µm) (Hansen & Alstrup 1995: 35–37).

Additional specimens examined: **Finland:** *Ostrobotnia media*: Kälviä, Ruotsalo, on *P. saxatilis*, v 1967, *Takala* 150 (H); *Savonia borealis*: Suonenjoki, Tenhanniemi, on *P. saxatilis*, vi 1967, *Takala* 157 (H).—**France:** *Pyénées-Atlantiques*: S of Tardets-Sorholus, between S^{te}-Engrâce and Pierre-S^t-Martin, on *P. saxatilis*, vii 1990, *Diederich* 9353; *ibid.*, vii 1991, *Diederich* 9533 & *Etayo* (UPS, hb. Diederich).—**Spain:** *Navarra*: W of Pamplona, Sierra de Urbasa, P^{to} de Urbasa, on *P. saxatilis* and *P. sulcata*, vii 1991, *Diederich* 9636, 9637 & *Etayo*; near Pierre-S^t-Martin, Larra (near the French border), on *P. saxatilis*, vii 1991, *Diederich* 9711 & *Etayo*; N Ochagavía, bosque de Iraty, NNE of the lake, natural reserve 'Lizardoya', on *P. saxatilis*, vii 1991, *Diederich* 9670 & *Etayo*; Baraibar, S of Miguel de Aralar, on *P. saxatilis*, x 1991, *Etayo* 6023; Lizaso, valle de la Ulzama, on *P. sulcata*, vii 1991, *Etayo* 5964 & *Diederich*; Roncesvalles, Lindux wood, on *P. saxatilis*, ix 1991, *Etayo* 6014.

Zwackhiomyces dispersus (Lahm ex Körb.) Triebel & Grube

This species, confined to the thalli of *Protoblastenia rupestris*, is previously known from Great Britain, Germany (Grube & Hafellner 1990) and Spain (Cataluña) (Navarro-Rosinés *et al.* 1994).

Spain: *Navarra*: Usún, foz de Arbayún, 500 m, on shaded rocks, on *Protoblastenia rupestris*, viii 1994, *Etayo* 12788.

Zwackhiomyces coepulonus (Norm.) Grube & R. Sant.

This fungus is common on species of *Caloplaca* and *Xanthoria* in Europe (Grube & Hafellner 1990). In continental Spain it is known from Cataluña (Navarro-Rosinés *et al.* 1994).

Spain: *Huesca*: Formigal, 1500 m, on *Xanthoria elegans*, viii 1991, *Etayo* 11021. *Navarra*: W of Pamplona, Sierra de Urbasa, P^{to} de Urbasa, on *X. parietina*, vii 1991, *Diederich* 9629 & *Etayo* 5692; Larra, Ilano de Eskilzarra, c. 1400 m, on *Caloplaca chalybaea*, ix 1995, *Etayo* 13081; *ibid.*, near the Refugio, c. 1460 m, on *X. sorediata*, xii 1995, *Etayo* 13087; Arguedas, Bardenas, embalse de las cortinas, near Cabezo de Castildetierra, 400 m, on a saxicolous *Caloplaca*, iii 1993, *Etayo* 13850.

We thank Dr Emmanuël Sérusiaux (Liège) for sending us his collection of *Polycoccum microcarpum* and for studying the host of the type specimen of *Llimoniella pubescens* by TLC, the curator of H for the loan of additional specimens of *Sphaerellothecium parmeliae*, Dr Brian Coppins for additional British records of several species, Prof. Rolf Santesson for critical remarks on some species, and Dr Claude Roux for reading and commenting on major parts of the manuscript.

REFERENCES

- Aptroot, A., Diederich, P., Sérusiaux, E. & Sipman, H. J. M. (1997) Lichens and lichenicolous fungi from New Guinea. *Bibliotheca Lichenologica* **64**: 1–220.
- Clauzade, G., Diederich, P. & Roux, C. (1989) Nelikeniğintaj fungoj likenloğaj. Ilustrita determinlibro. *Bulletin de la Société Linnéenne de Provence, numéro spécial* **1**: 1–142.
- Coppins, B. J. (1989) Notes on the Arthoniaceae in the British Isles. *Lichenologist* **21**: 195–216.
- Coppins, B. J. (1992) *Arthonia* Ach. In: *The lichen flora of Great Britain and Ireland* (O. W. Purvis, B. J. Coppins, D. L. Hawksworth, P. W. James & D. M. Moore, eds): 74–88. London: Natural History Museum Publications.
- Coste, C. (1993) *Arthonia graphidicola* Coppins (Arthoniales, Arthoniaceae) dans le département du Tarn (France, 81). *Bulletin de liaison de la Société Castraise de Sciences Naturelles* **1993**: 51–54.

- Diederich, P. & Etayo, J. (1994) Taxonomic notes on the genus *Plectocarpon* (lichenicolous Ascomycotina). *Nordic Journal of Botany* **14**: 589–600.
- Diederich, P. & Roux, C. (1991) Champignons lichénicoles non lichénisés récoltés dans la forêt de Fontainebleau et à Saint-Mammès (Seine-et-Marne, France). *Bulletin de l'Association Française de Lichénologie* **16**(12): 19–25.
- Diederich, P., Sérusiaux, E. & Boom, P. van den (1991) Lichens et champignons lichénicoles nouveaux ou intéressants pour la flore de la Belgique et des régions voisines. V. *Lejeunia*, nouvelle série **136**: 1–47.
- Etayo, J. (1996) Contribución al conocimiento de los líquenes y hongos líquenicolas de Mallorca (Islas Baleares, España). *Bulletin de la Société linnéenne de Provence* **47**: 111–121.
- Etayo, J. & Diederich, P. (1996) Lichenicolous fungi from the western Pyrenees, France and Spain. III. Species on *Lobaria pulmonaria*. *Bulletin de la Société des Naturalistes luxembourgeois* **97**: 93–118.
- Grube, M. & Hafellner, J. (1990) Studien an flechtenbewohnenden Pilzen der Sammelgattung *Didymella* (Ascomycetes, Dothideales). *Nova Hedwigia* **51**: 283–360.
- Hafellner, J. (1993) Über Funde von lichenicolen Pilzen und Flechten im südlichen Norwegen. *Herzogia* **9**: 749–768.
- Hafellner, J. (1994) Beiträge zu einem Prodrömus der lichenicolen Pilze Österreicher und angrenzender Gebiete. I. Einige neue oder seltene Arten. *Herzogia* **10**: 1–28.
- Hansen, E. S. & Alstrup, V. (1995) The lichenicolous fungi on *Cladonia* subgenus *Cladina* in Greenland. *Graphis Scripta* **7**: 33–38.
- Hawksworth, D. L. (1986) Notes on British lichenicolous fungi: V. *Notes from the Royal Botanic Garden Edinburgh* **43**: 497–519.
- Hawksworth, D. L. (1990) Notes on British lichenicolous fungi: VI. *Notes from the Royal Botanic Garden Edinburgh* **46**: 391–403.
- Hawksworth, D. L. & Diederich, P. (1988) A synopsis of the genus *Polycoccum* (Dothideales), with a key to accepted species. *Transactions of the British Mycological Society* **90**: 293–312.
- Holien, H. & Triebel, D. (1996) *Spirographa vinosa*, a new odontotremoid fungus on *Ochrolechia* and *Pertusaria*. *Lichenologist* **28**: 307–313.
- Kondratyuk, S. Y., Navrotskaya, I. L., Zelenko, S. D., Wasser, S. P. & Nevo, E. (1996) *The First Checklist of Lichen-forming and Lichenicolous Fungi of Israel*. Haifa: Peledfus Publishing House.
- Kümmerling, H., Triebel, D. & Rambold, G. (1993) *Lepraria neglecta* and its lichenicolous fungi. Festschrift S. Huneck. *Bibliotheca Lichenologica* **53**: 147–160.
- Matzer, M. (1993) Beitrag zur Kenntnis der Ascomycetengattungen *Globosphaeria*, *Roselliniopsis* und *Synaptospora*. *Cryptogamie, Mycologie* **14**: 11–19.
- Matzer, M. & Hafellner, J. (1990) Eine Revision der lichenicolen Arten der Sammelgattung *Rosellinia* (Ascomycetes). *Bibliotheca Lichenologica* **37**: 1–138.
- Navarro-Rosinés, P., Boqueras, M. & Llimona, X. (1994) Primer catàleg dels fongs líquenicols de Catalunya i zones pròximes (NE de la Península Ibèrica). *Bulleti de la Societat Catalana de Micologia* **16–17**: 165–204.
- Roux, C. & Triebel, D. (1994) Révision des espèces de *Stigmidium* et de *Sphaerellothecium* (champignons lichénicoles non lichénisés, Ascomycetes) correspondant à *Pharcidia epicymatia* sensu Keissler ou à *Stigmidium schaeferi* auct. *Bulletin de la Société linnéenne de Provence* **45**: 451–542.
- Santesson, R. (1993) *The Lichens and Lichenicolous Fungi of Sweden and Norway*. Lund: SBT-förlaget.
- Santesson, R. & Tønberg, T. (1994) *Arthrorhaphis aeruginosa* and *A. olivaceae*, two new lichenicolous fungi. *Lichenologist* **26**: 295–300.
- Sherwood-Pike, M. A., Hawksworth, D. L. & Coppins, B. J. (1980) *Skyttea*, a new genus of odontotremoid lichenicolous fungi. *Transactions of the British Mycological Society* **75**: 479–490.
- Triebel, D. (1989) Lecideicole Ascomyceten. Eine Revision der obligat lichenicolen Ascomyceten auf lecideoiden Flechten. *Bibliotheca Lichenologica* **35**: 1–278.
- Triebel, D., Rambold, G. & Nash III, T. H. (1991) On lichenicolous fungi from continental North America. *Mycotaxon* **41**: 263–296.